MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: Joe Hamblin

FROM: Dennis Killian

DATE: July 13, 1989

SUBJECT: Boiler Inspections, November, 1989, Outage

FILE: 01.12.02 & 43.5800

Attached are preliminary copies of the inspection items on Unit 1 and Unit 2 Boilers for the November outages. Please review the lists for completeness, and if you are in agreement, we wish to schedule a meeting with the B&W inspector during August to finalize the inspection lists. Please call Dennis Cole at extension 6463 if there are any questions.

EDC:vc
Attachments

cc: Mike Alley
Rick Houston
Dale Hurd
George Ladamus
Bob Morris
Aaron Nissen
Stan Smith

IP7_004378

UNIT 1 BOILER INSPECTION
SCHEDULED OUTAGE----------NOVEMBER 1989

Review the previous outage reports and schedule a jobsite meeting with the B&W service representative in August or September to review the inspection requirements. Contact the Hartford Steam Boiler inspector to advise him of the inspections and determine any items he may have.

AIR TEST
Air test the waterside of the boiler at the beginning of the outage. The drum vents (east and west) are used for connections to the air supply. Install a temporary test gage (100 psi) to monitor the test. Inspect the penthouse, convection pass, and bottom ash areas.

BOILER SAFETY VALVES
No boiler safety valves need to be overhauled during this outage unless they are leaking. Live testing of main steam safety relief valves has been recommended by Dresser, however, shut down schedules have not allowed this work.

PENTHOUSE
Inspect the floor casing. Areas along the inboard side of both sidewalls, between the superheat outlet and reheat outlet headers, and behind the reheat outlet headers have been repaired more frequently than other locations. Identify repair locations with paper tags numbered sequentially with a written description of the damage.

Check hanger rods for tightness including those on top of the boiler roof. The riser tubes just north of the steam drum are supported off clamps attached to front wall hanger rods. Some of these clamps have slipped previously. Also inspect aa percentage of hanger rod threads by wire brushing and dye penetrant testing.

Inspect the superheat outlet header lugs. B&W has ground flush all welds found with cracks, and has wrapped the center portion of the lugs.

Inspect header handhole caps for cracked seal welds.

Inspect the steam drum internals for tightness.

Inspect insulation for holes and locations where tie anchors may break loose.

Inspect the front waterwall header tie welds. These welds have cracked on two occasions and were repaired by B&W.

BOILER

SUPERHEATER
Inspect spacer bars, spacer tube clips, and split ring castings. B&W

has been asked to resolve the misalignment of the superheat outlet pendants.

FRONT SCREEN TUBES

Slide the tube shields (86) up the tubes and dye penetrant test the welds at the penetration through the arch floor. Inspect the vibration bars for broken clips. Install a ladder access on one side of the boiler to reach the vibration bars.

FRONT AND REAR SLOPE FLOORS

The trusses and overturn posts are bolted such that expansion movement is limited. There is also considerable flame impingement from the lower level burners.
Install skyclimber access platforms on the rear and front slope floors. Inspect the panel seams at the truss elevations. Take tube wall thickness readings at 5 foot elevation spacings on each tube across the front and rear walls for a total of 6102 readings. Take selected tube samples based on wall thickness.

LOWER WATERWALL HEADERS

Tube failures have occurred at the attachment weld to the headers. Inspect these welds at selected locations which will require access around the perimeter of the hopper. Wire brushing will be needed to clean welds.

CONVECTION PASS

REHEATER OUTLET

The support clips located three (3) feet below the roof tubes were previously repaired by B&W. The old clips were removed, and new clips of 2-1/4 chrome were installed just below them. Leaks have since occurred at panels 44 and 36 numbered from the left hand sidewall, and were a result from the repair work.
Visually inspect all of the panels at the clip elevation. Install a ladder from the 14 to 15 elevation up the rear side of the reheater. Lay plank across the reheater elements from east to west. Place another ladder up the rear side of the reheater to reach the clips. The ladder will have to be moved approximately 30 times for inspection. Inspect each panel for evidence of leakage and select two tubes along with the clips to remove for testing. Notify Stan Smith to examine the tube internals for surface condition. Test the sample tubes at a laboratory for defects in accordance with B&W ARC report dated May 19, 1989 (see attachment).

Check for sootblower errosion at IK-61 and 62 location.

Inspect the D-links near the bottom of the reheat pendants for broken welds.

Inspect the spacer bars near the bottom of the reheat pendants front and rear.

REAR WALL

Inspect the 6th tube over from the left hand sidewall below IK-91 for errosion. A requisition has been written to repair the erroded spot.

SIDEWALLS

Inspect sootblower pockets for tube errosion.

Inspect at rear screen tube refractory for tube errosion.

HORIZONTAL REHEAT

Verify alignment of saddles and bumpers.

Inspect refractory baffles for missing pieces.

Check tubes at sootblower locations.

Inspect external surfaces and attachments on the inlet header. Need an access ladder from the biasing dampers.

Inspect tubes along sidewall and at bends for errosion.

BAFFLE WALL

Inspect intermediate headers and lower header for cracks in the membrane at the joints.

PRIMARY SUPERHEAT

Inspect tubes at the sootblower locations, sidewalls, and bends for errosion.

ECONOMIZER

Inspect attachment welds on the intermediate and the inlet headers.

Inspect anchor rods to the rear wall, and also tube clearance with the rear wall and baffle wall.

LOWER HEADERS

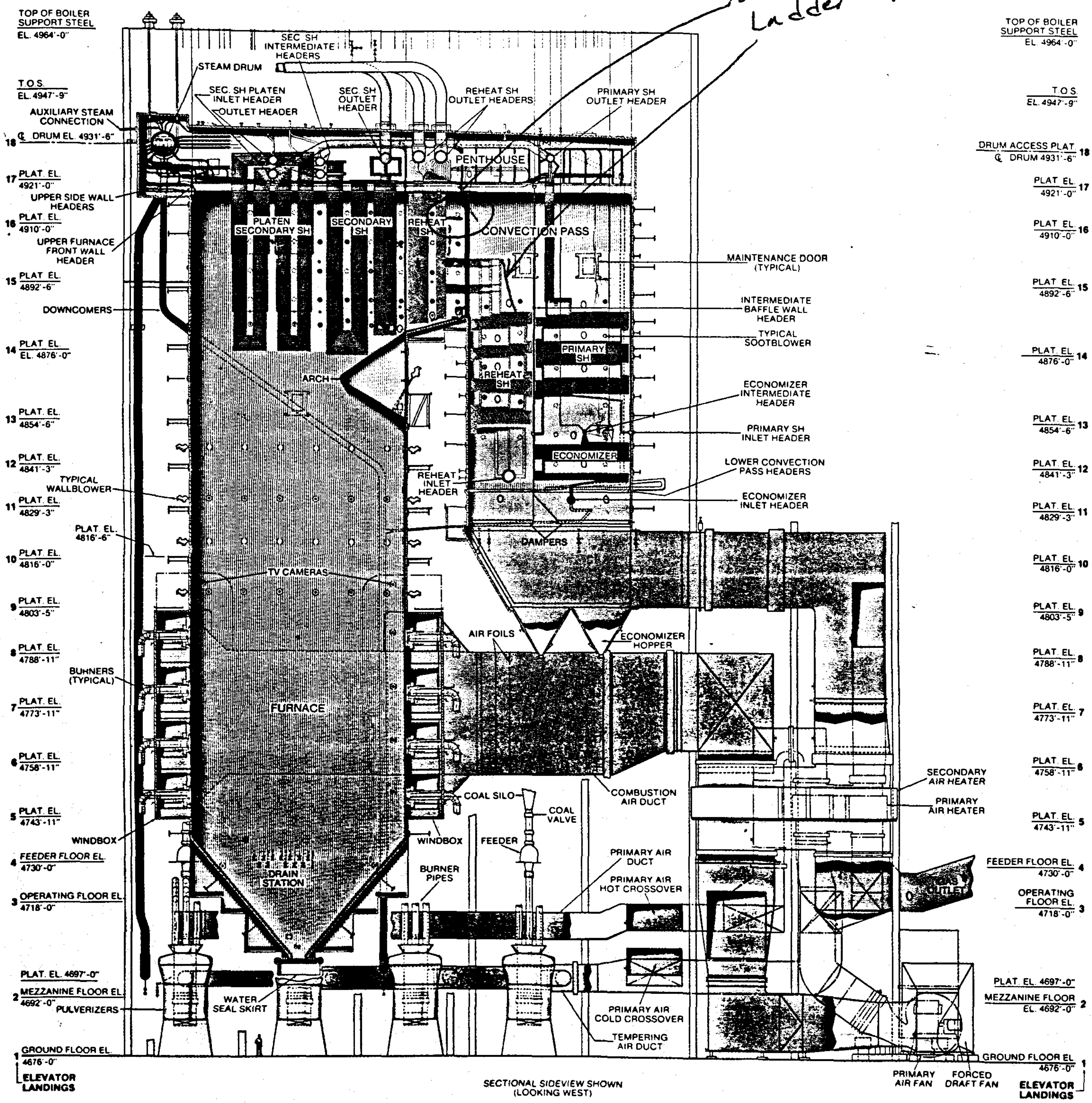
Inspect the lower headers at each of the splice joints for cracks in the membrane. Location is just above the biasing dampers.

SUMMARY

A plan is needed for layout of tube thickness readings along the furnace sloped floors along with specification and cost estimates.
The boiler buckstays are being reviewed under a CMP with Chuck Finnegan. Inspection services for the buckstays are separate from this inspection.
Tube samples from the reheat support clip area are needed to determine if further cracking is developing. B&W tests indicate a creep mechanism type failure. Since the clips are under extended warrantee, testing will be by IPSC. Any repair work will be performed by B&W.
Based on analytical tests made on turbine samples (4/12/89), no exfoliation type inspections in superheat or reheat areas are planned. (Tests are attached).

Unit 1

Reheat Outlet access.



COLOR KEY

- AIR
- GAS
- WATER
- STEAM
- REHEAT

INTERMOUNTAIN POWER PROJECT
UNIT NO'S. 1 & 2
DELTA, UTAH

CAPACITY, LB STEAM PER HOUR	6,600,000	SUPERHEATER OUTLET TEMPERATURE, F	1005
SUPERHEATER OUTLET PRESSURE PSI	2975	REHEATER OUTLET TEMPERATURE, F	1005

BABCOCK & WILCOX RADIANT REHEAT BOILER

Babcock & Wilcox

a McDermott company

Suite 410
7401 West Mansfield Avenue
Lakewood, CO 80235
(303) 988-8203

June 15, 1989

Department of Water & Power
City of Los Angeles
111 North Hope Street
Room 604
Los Angeles, California 90051

Attn: Mr. Raffi Krikorian

Re: Reheater Support Lug Attachment Cracking
ARC Report Rdd:90:6404-01-01:01
Babcock & Wilcox Contract RB-614

Dear Raffi:

Attached are three (3) copies of the above referenced report for your review. The report references four reheat superheater outlet leg tubes with support lug castings from Unit #1, at Delta, Utah.

The results of the analysis by The Alliance Research Center on the four tube sections is as follows:

- The chemical compositions of casting and the tube material were found to be in conformance with respective specifications.
- The chemical composition of the weld metal was considered normal for a weld made with Inconel 182 type electrode.
- Cracking was observed in most of the weld joints and was localized along the tube-to-weld interface, originating from the weld root and propogating intergranularly on the ferritic side, a few grain diameters away from the weld fusion line.
- No correlation was found between the direction of welding and crack severity.
- Fractographic analysis revealed that the weld interface cracking was associated with a creep mechanism and was typical of dissimilar metal weld failures.
- Welds attaching the casting to the tube, contained a mixture of one, two and three pass welds.

- Comparatively, cracking in the three pass weld joints was found to be less severe than the one pass or two pass weld joints.

- Comparatively, the degree of cracking was greater at the locations remote from the load bearing end of the castings.

Should you have any questions concerning the report, please do not hesitate to contact me at the Denver office.

Very Truly Yours,

BABCOCK & WILCOX COMPANY

F. J. McGinley, Jr.
District Engineer

cc: w/attachments
~~D. Cole - IPSC~~
J. Hintze - IPSC

INTERMOUNTAIN POWER SERVICE CORPORATION

b1080
File: 01.03.01
14.8900 4/11

April 12, 1989

Mr. Bruce E. Blowey
Engineer of Generation - External
LADWP
P.O. Box 111, Room 1255E
Los Angeles, CA 90051

Dear Mr. Blowey:

Analytical Results of Unit 1 Turbine Samples

Attached are the analytical results of samples taken from the turbine buckets and diaphragms (along with miscellaneous other equipment) during the Unit 1 Major Outage. Following is a brief discussion of our observations.

LP Turbine Samples

Samples on the LP Sections were all scraped from the respective areas as indicated on the report. Sample #3LP-1C, Diaphragm 19th Stage, has an error in the reported data -- "Silicon as SiO2" should be 0.42% and "Iron as Fe2O3" should be 95.12%.

The LP section buckets show higher deposit levels of chromium and molybdenum than do the diaphragm sides. The reasons for this are unknown. However, the level of iron, in conjunction with the Cr/Mo, indicates that reheat steam piping exfoliation is occurring to a small extent.

Copper levels in the LP sections seem to indicate some steam contamination through the reheat steam piping or through the reheat attemperator sprays. However, the "Reheat Tube Hot Reheat Superheat Section" sample showed very low copper levels which indicates that copper is being introduced after th reheat superheat section, probably through the attemperator sprays.

Phosphates are only used in our cycle water system during start-ups. The level of phosphates in the LP section samples are relatively in line with other contaminants such as copper, sodium, silica, sulfate and chloride, indicating that most of these contaminants are probably carried over durin the start-ups.

HP Turbine Samples

The HP Turbine had samples which were scraped as well as samples of small shot-appearance material which were picked up near the #3 Diaphragm. Shot-appearance material was also picked up in LP Heater #4, water side.

This shot material is almost completely iron and is probably all the same material, as the analyses indicate, either used in various areas of the system during construction as a blast material, or used in one location during construction and blown into the steam side through the attemperator spray system during initial operation. It is doubtful that this material carried over in the steam due to its size and weight.

A Unit 1 HP section scraped sample was compared to one taken from Unit 2 i October, 1988. The sample results are relatively close except in sodium and in phosphate. However, sodium levels follow the phosphate levels on both units. Phosphate treatment on start-ups is by addition of trisodium phosphate and it follows that phosphate and sodium contamination is from the unit start-ups. Unit 2 initial start-up used significantly more trisodium phosphate than Unit 1 start-up (Unit 2 system started up dirtier which explains why the levels of contamination are higher in Unit 2.

Copper levels are also relatively high in the HP section. Our All Volatil Treatment during normal operation includes ammonia addition which can attack copper condenser tubes. With the removal of the copper/nickel tubes, this number should disappear in future inspections. Attemperator sprays and steam drum carry over are the most likely entrances for copper contamination to the main steam.

Iron on the buckets was not as high as on the LP sections but the HP buckets did have a blasted appearance upon initial inspection.

Generator Samples

One generator dome and one generator retaining ring sample were run. The retaining ring sample had a filamentous appearance and texture, like fiberglass insulation. The high silica on the sample indicates glass material in some form. TOC levels on the generator dome sample indicate relatively high organics, such as oil. The sample definitely had an oily appearance. The remainder of the sample was almost completely iron.

Conclusions

Based on our evaluation of the available samples, it appears that start-up and attemperator sprays are the main sources of turbine steam contamination. We feel that the existing water treatment program is effective and should be continued. Attemperator spray flow rates and thei respective levels of contamination will be reviewed. On start-ups, some better initial cleanup procedures and treatments are being tested. We are optimistic that steam purity can be improved on the start-ups. Cold water chemical addition for dissolved oxygen and pH control has reduced initial iron concentrations. Cold water flushing and cycling through condensate polishers has been effective in other contaminant removal prior to fires in the boiler. As well, hopefully the worst start-ups are now behind us.

Please feel free to direct any questions or comments to Mr. Stan Smith at (801) 864-4414, extension 6430.

Sincerely,

S Gale Chapman

S. Gale Chapman
President & Chief Operations Officer

DHC
SLS
SLS:vc
attachments

cc: Mo Abdel-aal
Bob Davis
Jim Fox
Joe Hamblin
Jerry Hintze

WAL, Inc.

6385 W. 52nd Ave., #5 (303) 420-7700 Arvada, CO 80002

February 17, 1988

Ms. Cindy Jones
Intermountain Power Service Corp.
P.O. Box 864
Delta, Utah 84624

RE: PO # 89-27443
WAL # 89042

Analytical Report

Element	Concentration, Wt% as Received UNIT #1 #3LP-1L BUCKETS 19th STAGE	UNIT #1 #2LP 1B/1C BUCKETS 18th STAGE	UNIT #1 #3LP 1B/1C BUCKETS 17th STAGE
Iron as Fe_2O_3	89.11	88.75	89.39
Phosphorus as PO_4^{3-}	0.23	0.46	0.41
Silicon as SiO_2	0.36	1.00	0.58
Sodium Na_2O	0.32	0.18	0.09
Sulfate, SO_4^{2-}	0.09	0.01	0.07
Copper	0.11	0.23	0.24
Chromium	1.59	1.45	1.53
Molybdenum	0.42	0.39	0.41
Chloride	0.05	0.11	0.06

Element	Concentration, Wt% as Received UNIT #1 #3LP-1C DIAPHRAGM 20th STAGE	UNIT #1 #2LP-1B BUCKETS 19th STAGE	UNIT #1 #3LP-1C DIAPHRAGM 19th STAGE
Iron as Fe_2O_3	92.02	86.73	20.12 + 75.0
Phosphorus as PO_4^{2-}	0.03	0.11	0.35
Silicon as SiO_2	0.04	0.36	-75.0 78.42 *
Sodium Na_2O	0.31	0.15	0.22
Sulfate, SO_4^{2-}	0.07	0.04	0.05
Copper	0.06	0.18	0.42
Chromium	0.08	1.42	0.19
Molybdenum	<0.03	0.36	0.23
Chloride	0.13	0.08	0.11

Shot Material

Element	Concentration, Wt% as Received UNIT #1 FROM HP BY #3 DIAPHRAGM	UNIT #2 HP BUCKETS SEVERAL STAGES	UNIT #1 HP BUCKETS 4th & 5th STAGES
Iron as Fe_2O_3	97.95	46.75	44.88
Phosphorus as PO_4^{2-}	<0.01	18.88	11.86
Silicon as SiO_2	0.29	<0.1	<0.1
Sodium Na_2O	0.29	12.93	4.04
Sulfate, SO_4^{2-}	0.02	ND	<0.2
Copper	0.08	2.92	3.89
Chromium	0.62	0.81	0.07
Molybdenum	0.12	0.18	<0.03
Chloride	0.10	0.13	0.09

Page 2
RE: PO # 89-27443
WAL # 89042

shot material

Concentration, Wt% as Received

Element	LP HTR 4 WATER SIDE UNIT #1	UNIT #1 FROM REHEAT TUBES HOT REHEAT SUPERHEAT SECTIONS	UNIT #1 #3LP-1C BUCKETS 15 & 16 STG
Iron as Fe_2O_3	104.48	57.80	62.85
Phosphorus as PO_4^{2-}	0.05	<0.01	0.64
Silicon as SiO_2	<0.1	2.04	9.09
Sodium Na_2O	0.20	0.31	0.13
Sulfate, SO_4^{2-}	<0.02	0.91	0.32
Copper	0.14	0.03	0.33
Chromium	0.40	0.31	0.84
Molybdenum	0.09	0.09	0.42
Chloride	0.04	0.15	0.05

Concentration, Wt% as Received

Element	UNIT #1 GENERATOR FIELD DUST UNDER RETAINING RINGS	C-CONDENSATE PUMP SECTION 2-14-89
Iron as Fe_2O_3	6.72	85.45
Phosphorus as PO_4^{2-}	--	0.03
Silicon as SiO_2	20.96	4.52
Sodium Na_2O	0.66	0.18
Sulfate, SO_4^{2-}	--	0.21
Copper	0.47	0.04
Chromium	--	0.57
Molybdenum	--	<0.03
Chloride	--	0.59

Charles R. Wilson
Charles R. Wilson

WAL, Inc.
6385 W. 52nd Ave., #5 (303) 420-7700 Arvada, CO 80002

WAL, Inc.

6385 W. 52nd Ave., #5 (303) 420-7700 Arvada, CO 80002

March 15, 1989

Ms. Cindy Jones
Intermountain Power Service Corp.
P.O. Box 864
Delta, Utah 84624

RE: WAL # 89067

RE: PO# 878975
REL# 39

shot material

Analytical Report

Concentration, Wt% as Received

Element	UNIT #1 2-4-89 HP TURBINE 4th STAGE	UNIT #1 3-1-89 GENERATOR DOME ID# 370T150
Iron as Fe_2O_3	102.34	109.35
Silicon as SiO_2	0.28	1.77
Sodium Na_2O	0.14	0.27
Sulfate, SO_4^{2-}	0.29	--
Copper	0.11	0.20
Chromium	0.66	0.31
Molybdenum	0.12	0.04
Chloride	0.04	--
TOC	--	2.29

Charles R. Wilson

Charles R. Wilson

UNIT 2 BOILER INSPECTION
SCHEDULED OUTAGE-----------------NOVEMBER 1989

Review the previous outage reports and schedule a jobsite meeting with the B&W service representative in August or September to review the inspection requirements. Contact the Hartford Steam Boiler inspector to advise him of the inspections and determine any items he may have.

AIR TEST
Air test the waterside of the boiler at the beginning of the outage. The drum vents (east and west) are used for connections to the air supply. Install a temporary test gage (100) psi to monitor the test. Inspect the penthouse, convection pass, and bottom ash areas.

BOILER SAFETY VALVES
All boiler safety relief valves need to be overhauled during this outage. A Dresser green tag service center will perform the work. A specification has been written that lists valve critical dimensions and other important information to document the work on each valve. The completed specification information is to be provided to maintenance and technical services after the overhaul. Live testing of main steam safety relief valves has been recommended by Dresser, however shutdown schedules have not allowed it.

PENTHOUSE
Inspect the floor casing. Areas along the inboard side of both sidewalls, between the superheat outlet and reheat outlet headers, and behind the reheat outlet headers have been repaired more frequently than other locations. Identify repair locations with paper tags numbered sequentially with a written description of the damage.

Check hanger rods for tightness including those on top of the boiler roof. The riser tubes just north of the steam drum are supported off clamps attached to the front wall hanger rods. Some of these clamps have slipped previously. Also inspect a percentage of hanger rod threads by wire brushing and dye penetrant testing.

Inspect the superheat outlet header lugs. B&W has ground flush all welds found with cracks, and has wrapped the center portion of the lugs.

Inspect header handhole caps for cracked seal welds.

Inspect the steam drum internals for tightness.

Inspect insulation for holes and locations where tie anchors may break loose.

BOILER

SUPERHEATER

Inspect intermediate superheat panel 37 numbered from the left hand sidewall. The bottom of the panel is warped out of alignment as noted in a previous B&W inspection report.

Inspect spacer bars, spacer tube clips, and split ring castings.

FRONT SCREEN TUBES
Slide the tube shields (86) up the tubes and dye penetrant test the welds at the penetration through the arch floor. Inspect the vibration bars for broken clips. Install a ladder access on one side of the boiler to reach the vibration bars.

FRONT AND REAR SLOPE FLOORS
There is considerable flame impingement from the lower level burners along both lower walls. There are indications of casing flyash leaks on the rear wall trusses at elevations 4725' and 4712'. The tube thickness survey of October 1988 shows significant wall thickness reduction.
Install skyclimber access platforms on the rear and the front slope floors. Inspect the panel seams at the truss elevations. Take tube wall thickness readings at 5 foot elevation spacings on every tube across the front and rear walls for a total of 6102 readings. Remove tube samples based on the thickness readings.

LOWER WATEREALL HEADERS
Inspect tube attachment welds to the header. Access around the perimeter of the hopper will be needed.

CONVECTION PASS

REHEATER OUTLET
The support clips located 3' below the roof tubes were previously repaired by B&W. The original shop welds were removed, and the existing clips were rewelded using multiple stringers.
Visually inspect all of the panels at the clip elevation. Install a ladder from the 14 to 15 elevation up the rear side of the reheater. Lay plank across the reheater elements from east to west. Place another ladder up the rear side of the reheater to reach the clips. The ladder will have to be moved approximately 30 times for inspection. Inspect each panel for evidence of leakage and select two tubes along the clips to remove for testing. Notify Stan Smith to examine the tube internals for surface condition. Test the sample tubes at a laboratory for defects in accordance with B&W ARC report dated May 19, 1989 (see attachment).

Check for sootblower errosion at IK-61 and 62 location.

Inspect the D-links near the bottom of the reheat pendants for broken welds.

Inspect the spacer bars near the bottom of the reheat pendants front and rear.

SIDEWALLS
Inspect sootblower pockets for tube errosion.

Inspect at rear screen tube refractory for tube errosion.

HORIZONTAL REHEAT
Verify alignment of saddles and bumpers.

Inspect refractory baffles for missing pieces.

Check tubes at sootblower locations.

Inspect external surfaces and attachments on the inlet header. Need an access ladder from the biasing dampers.

Inspect tubes along sidewalls and at bends for errosion.

BAFFLE WALL

Inspect intermediate headers and lower header for cracks in the membrane at the joints.

Inspect tube #46 from the left hand sidewall. The riser tube may be in compression as noted in a previous B&W report.

PRIMARY SUPERHEAT

Inspect tubes at the sootblower locations, sidewalls, and bends for errosion.

ECONOMIZER
Install retaining washers on all support pins located on the 12 and 13 floors. Cotter pins are not holding the support pins in place.

Inspect attachment welds on the intermediate and the inlet headers.

Inspect anchor rods to the rear wall, and also tube clearance with the rear wall and baffle wall.

LOWER HEADERS
Inspect the lower headers at each of the splice joints for cracks in the membrane. Location is just above the biasing dampers.

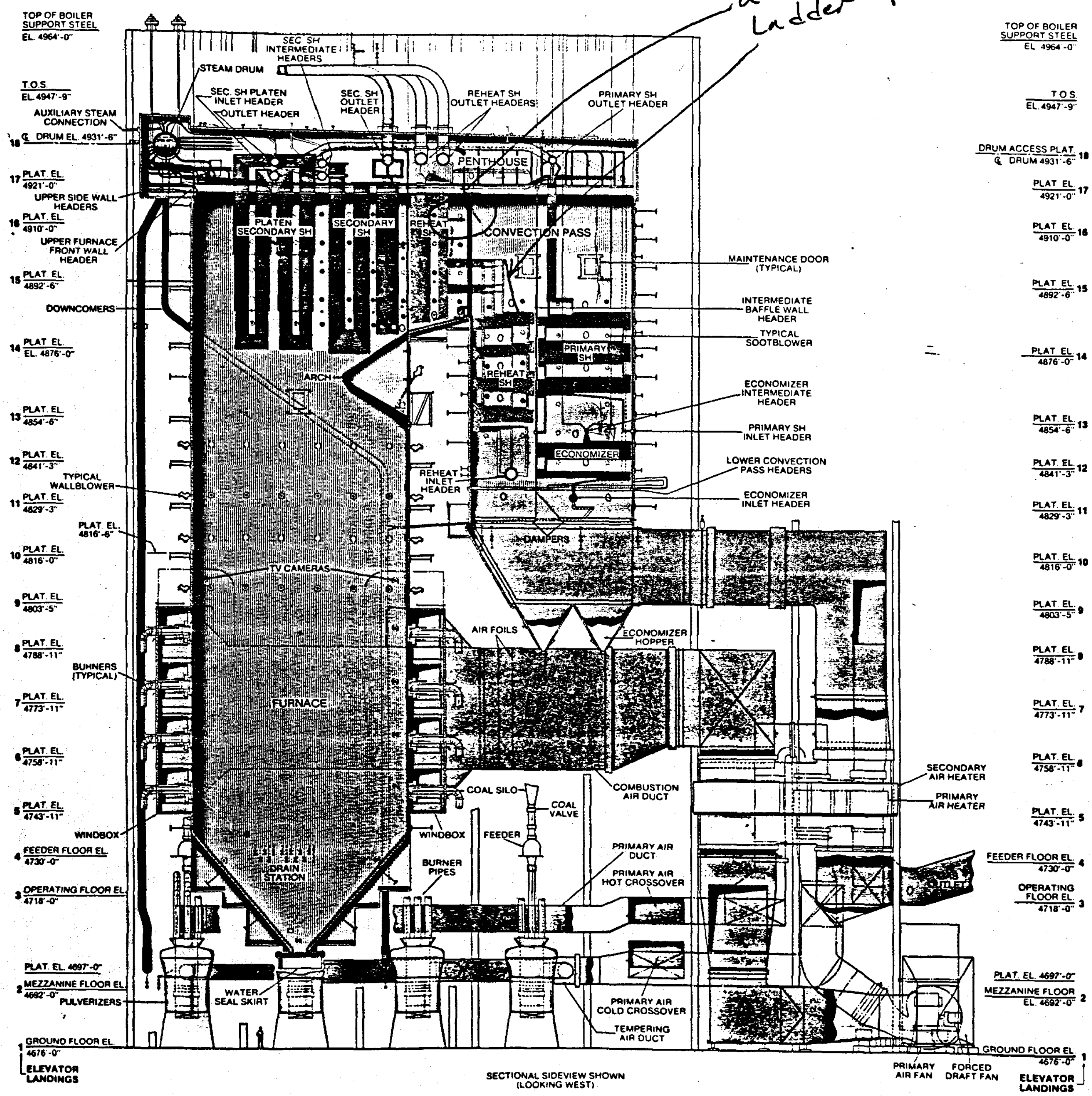
SUMMARY
A plan is needed for layout of tube thickness readings along the furnace sloped floors along with specification and cost estimates.
The boiler buckstays are being reviewed under a CMP with Chuck Finnegan. Inspection services for the buckstays are separate from this inspection.
Tube samples from the reheat support clip area are needed to determine if further cracking is developing. B&W tests indicate a creep mechanism type failure. Since the clips are under extended warrantee,

testing will be by IPSC. Any repair work will be performed by B&W. Based on analytical tests made on turbine samples (4/12/89), no exfoliation type inspections in superheat or reheat areas are planned. (Tests are attached).

Unit 2

Reheater Outlet Access.

access. Ladder + walkway?



COLOR KEY

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INTERMOUNTAIN POWER PROJECT
UNIT NO'S. 1 & 2
DELTA, UTAH

CAPACITY, LB STEAM PER HOUR	6,600,000	SUPERHEATER OUTLET TEMPERATURE, F	1005
SUPERHEATER OUTLET PRESSURE PSI	2975	REHEATER OUTLET TEMPERATURE, F	1005

BABCOCK & WILCOX RADIANT REHEAT BOILER

Babcock & Wilcox

a McDermott company

Suite 410
7401 West Mansfield Avenue
Lakewood, CO 80235
(303) 988-8203

June 15, 1989

Department of Water & Power
City of Los Angeles
111 North Hope Street
Room 604
Los Angeles, California 90051

Attn: Mr. Raffi Krikorian

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- o Cracking was observed in most of the weld joints and was localized along the tube-to-weld interface, originating from the weld root and propogating intergranularly on the ferritic side, a few grain diameters away from the weld fusion line.

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- o Comparatively, the degree of cracking was greater at the locations remote from the load bearing end of the castings.

Should you have any questions concerning the report, please do not hesitate to contact me at the Denver office.

Very Truly Yours,

BABCOCK & WILCOX COMPANY

F. J. McGinley, Jr.
District Engineer

cc: w/attachments
D. Cole - IPSC
J. Hintze - IPSC

INTERMOUNTAIN POWER SERVICE CORPORATION

b1080
File: 01.03.01
14.8900 4/11

April 12, 1989

Mr. Bruce E. Blowey
Engineer of Generation - External
LADWP
P.O. Box 111, Room 1255E
Los Angeles, CA 90051

Dear Mr. Blowey:

Analytical Results of Unit 1 Turbine Samples

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The HP Turbine had samples which were scraped as well as samples of small shot-appearance material which were picked up near the #3 Diaphragm. Shot-appearance material was also picked up in LP Heater #4, water side.

This shot material is almost completely iron and is probably all the same material, as the analyses indicate, either used in various areas of the system during construction as a blast material, or used in one location during construction and blown into the steam side through the attemperator spray system during initial operation. It is doubtful that this material carried over in the steam due to its size and weight.

A Unit 1 HP section scraped sample was compared to one taken from Unit 2 in October, 1988. The sample results are relatively close except in sodium and in phosphate. However, sodium levels follow the phosphate levels on both units. Phosphate treatment on start-ups is by addition of trisodium phosphate and it follows that phosphate and sodium contamination is from the unit start-ups. Unit 2 initial start-up used significantly more trisodium phosphate than Unit 1 start-up (Unit 2 system started up dirtier) which explains why the levels of contamination are higher in Unit 2.

Copper levels are also relatively high in the HP section. Our All Volatile Treatment during normal operation includes ammonia addition which can attack copper condenser tubes. With the removal of the copper/nickel tubes, this number should disappear in future inspections. Attemperator sprays and steam drum carry over are the most likely entrances for copper contamination to the main steam.

Iron on the buckets was not as high as on the LP sections but the HP buckets did have a blasted appearance upon initial inspection.

Generator Samples

One generator dome and one generator retaining ring sample were run. The retaining ring sample had a filamentous appearance and texture, like fiberglass insulation. The high silica on the sample indicates glass material in some form. TOC levels on the generator dome sample indicate relatively high organics, such as oil. The sample definitely had an oily appearance. The remainder of the sample was almost completely iron.

Conclusions

Based on our evaluation of the available samples, it appears that start-ups and attemperator sprays are the main sources of turbine steam contamination. We feel that the existing water treatment program is effective and should be continued. Attemperator spray flow rates and their respective levels of contamination will be reviewed. On start-ups, some better initial cleanup procedures and treatments are being tested. We are optimistic that steam purity can be improved on the start-ups. Cold water chemical addition for dissolved oxygen and pH control has reduced initial iron concentrations. Cold water flushing and cycling through condensate polishers has been effective in other contaminant removal prior to fires in the boiler. As well, hopefully the worst start-ups are now behind us.

Please feel free to direct any questions or comments to Mr. Stan Smith at (801) 864-4414, extension 6430.

Sincerely,

S Gale Chapman

S. Gale Chapman
President & Chief Operations Officer

DHL

SLS
SLS:vc
attachments

cc: Mo Abdel-aal
Bob Davis
Jim Fox
Joe Hamblin
Jerry Hintze

WAL, Inc.

6385 W. 52nd Ave., #5 (303) 420-7700 Arvada, CO 80002

February 17, 1988

Ms. Cindy Jones
Intermountain Power Service Corp.
P.O. Box 864
Delta, Utah 84624

RE: PO # 89-27443
WAL # 89042

Analytical Report

	Concentration, Wt% as Received		
Element	UNIT #1 #3LP-1L BUCKETS 19th STAGE	UNIT #1 #2LP 1B/1C BUCKETS 18th STAGE	UNIT #1 #3LP 1B/1C BUCKETS 17th STAGE
Iron as Fe_2O_3	89.11	88.75	89.39
Phosphorus as PO_4^{3-}	0.23	0.46	0.41
Silicon as SiO_2	0.36	1.00	0.58
Sodium Na_2O	0.32	0.18	0.09
Sulfate, SO_4^{2-}	0.09	0.01	0.07
Copper	0.11	0.23	0.24
Chromium	1.59	1.45	1.53
Molybdenum	0.42	0.39	0.41
Chloride	0.05	0.11	0.06

	Concentration, Wt% as Received		
Element	UNIT #1 #3LP-1C DIAPHRAGM 20th STAGE	UNIT #1 #2LP-1B BUCKETS 19th STAGE	UNIT #1 #3LP-1C DIAPHRAGM 19th STAGE
Iron as Fe_2O_3	92.02	86.73	20.12 + 75.0
Phosphorus as PO_4^{2-}	0.03	0.11	0.35
Silicon as SiO_2	0.04	0.36	-75.0 73.42 *
Sodium Na_2O	0.31	0.15	0.22
Sulfate, SO_4^{2-}	0.07	0.04	0.05
Copper	0.06	0.18	0.42
Chromium	0.08	1.42	0.19
Molybdenum	<0.03	0.36	0.23
Chloride	0.13	0.08	0.11

Shot Material

	Concentration, Wt% as Received		
Element	UNIT #1 FROM HP BY #3 DIAPHRAGM	UNIT #2 HP BUCKETS SEVERAL STAGES	UNIT #1 HP BUCKETS 4th & 5th STAGES
Iron as Fe_2O_3	97.95	46.75	44.88
Phosphorus as PO_4^{2-}	<0.01	18.88	11.86
Silicon as SiO_2	0.29	<0.1	<0.1
Sodium Na_2O	0.29	12.93	4.04
Sulfate, SO_4^{2-}	0.02	ND	<0.2
Copper	0.08	2.92	3.89
Chromium	0.62	0.81	0.07
Molybdenum	0.12	0.18	<0.03
Chloride	0.10	0.13	0.09

Page 2
RE: PO # 89-27443
WAL # 89042

shot material

Element	Concentration, Wt% as Received: LP HTR 4 WATER SIDE UNIT #1	UNIT #1 FROM REHEAT TUBES HOT REHEAT SUPERHEAT SECTIONS	UNIT #1 #3LP-1C BUCKETS 15 & 16 STG
Iron as Fe_2O_3	104.48	57.80	62.85
Phosphorus as PO_4^{2-}	0.05	<0.01	0.64
Silicon as SiO_2	<0.1	2.04	9.09
Sodium Na_2O	0.20	0.31	0.13
Sulfate, SO_4^{2-}	<0.02	0.91	0.32
Copper	0.14	0.03	0.33
Chromium	0.40	0.31	0.84
Molybdenum	0.09	0.09	0.42
Chloride	0.04	0.15	0.05

Element	Concentration, Wt% as Received: UNIT #1 GENERATOR FIELD DUST UNDER RETAINING RINGS	C-CONDENSATE PUMP SECTION 2-14-89
Iron as Fe_2O_3	6.72	85.45
Phosphorus as PO_4^{2-}	--	0.03
Silicon as SiO_2	20.96	4.52
Sodium Na_2O	0.66	0.18
Sulfate, SO_4^{2-}	--	0.21
Copper	0.47	0.04
Chromium	--	0.57
Molybdenum	--	<0.03
Chloride	--	0.59

Charles R. Wilson
Charles R. Wilson

WAL

WAL, Inc.

6385 W. 52nd Ave., #5 (303) 420-7700 Arvada, CO 80002

March 15, 1989

Ms. Cindy Jones
Intermountain Power Service Corp.
P.O. Box 864
Delta, Utah 84624

RE: WAL # 89067

RE: PO# 878975
REL# 39

shot material

Analytical Report

Concentration, Wt% as Received

Element	UNIT #1 2-4-89 HP TURBINE 4th STAGE	UNIT #1 3-1-89 GENERATOR DOME ID# 370T150
Iron as Fe_2O_3	102.34	109.35
Silicon as SiO_2	0.28	1.77
Sodium Na_2O	0.14	0.27
Sulfate, SO_4^{2-}	0.29	--
Copper	0.11	0.20
Chromium	0.66	0.31
Molybdenum	0.12	0.04
Chloride	0.04	--
TOC	--	2.29

Charles R. Wilson
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